

Report on the Cephalopoda in the Raffles Museum

By G. C. ROBSON, M.A., F.L.S.

Deputy Keeper of Zoology, British Museum (Natural History)
(Published by permission of the Trustees of the British Museum)

(Text figs. 1-4)

The collection of Cephalopoda from Singapore submitted to me for this report consists of 65 specimens representing some eighteen species. They are all littoral forms (*Octopus*, *Sepia*, etc.), obtained from the fishing-grounds or from the Singapore fish-market. Though it is not very large, the collection is of some value. It fills in many of the gaps in our knowledge concerning the distribution of Indo-Pacific species and brings into relief one very interesting fact. Although certain littoral Cephalopods have a wide range and are usually said to vary very little over a wide area, this collection reveals a fauna having a distinctive facies. It is, of course, a little open to question how far small collections of marine organisms numbering a few dozen specimens are a satisfactory index of the status of a given fauna. With this proviso it is to be noted that this collection

from Singapore has only two species in common with Hoyle's Maldive and Laccadive list of 1905 (35 specimens; 13 species and some young forms), one with Hoyle's Singhalese list of 1904 (83 specimens; 10 species and some young forms) and none with my list for the Gulf of Siam of 1928 (43 specimens and 8 species).

Some very interesting points remain to be noted. (1) The *Octopus filamentosus* from Pulau Pisang was "caught in the act of catching a large spider". The latter was identified by Mr. W. S. Bristowe (1931, p. 461) as "presumably *Desis*". This is a very novel and entirely unexpected prey for an *Octopus*.

(2) Attention is drawn to the structure of the tentacular manus of *Iniotenthis ? bursa* (p. 27). The suckers in this form are the smallest I have ever seen in any adult Cephalopod (smaller even than those of some species of *Mastigoteuthis*) and are only perceptible under a 40c. \times F=55 obj. Zeiss (binocular) as a faint powdery dusting over the manus. They seem to be quite perfectly formed.

(3) The occurrence of a new species of the uncommon genus *Sepiadarium* is interesting, as of the other species two are Australian and the third ranges from Ceylon to Japan. The fusion of the mantle to the funnel at the spot where the "adhesive organ" is found in other Cephalopods has most certainly been acquired independently from the other Decapods that show this remarkable phenomenon (cf. Robson 1932).

LIST OF SPECIES¹

SUB-CLASS DIBRANCHIATA

ORDER OCTOPODA

1. *Octopus filamentosus*. Orb.
2. " *horridus*, Orb.
3. " *smedleyi*, n. sp.
4. " *aegina*, Gray.
5. " ? *gardineri*, Hoyle.
6. " ? *macropus*, var.
7. " sp. (group of *australis*).

1. The types of *Octopus smedleyi* and *Sepiadarium malayense* are being retained in the Raffles Museum for the present for purposes of comparison. Ultimately they will be deposited in the British Museum in accordance with the established custom.

ORDER DECAPODA

8. *Iniotenthis ? bursa* Pfeffer, var.
9. *Sepiadarium malayense*, n. sp.
10. *Sepia singaporensis*, Pfr.
11. " ? *esculenta*, Hoyle.
12. " *latimanus*, Orb.
13. " sp. (group of *torosa*).
14. *Loligo ? duvaucelii*, Orb.
15. " spp. incert. (3).
16. *Sepioteuthis indica*, Pfr. and ? var. nov.

ORDER OCTOPODA

Octopus filamentosus, Blainville

One (♀) from Pulau Pisang: Dec. 1930: Coll. P.M. de F.

One (♂) from Pulau Siantan (Anamba Is.). 1925: Coll. F.N.C.

One (♂) from unknown locality.

The first is a typical dark specimen with arms 89% of the total length. It was noted as "caught in the act of catching a spider". Mr. W. S. Bristowe (1931, p. 461) states that it was reported as definitely eating the spider "presumably *Desis*".

In the same note the *Octopus* is alluded to as "tentacles 5 inches". Some mistake is evident here as the larger specimen has arms three times that length and those of the smaller are well in excess of the figure.

The second (and smaller specimen) is more tawny in colour. It has a small hectocotylus 3.7% of the 3rd arms, with a narrow ligula and very weakly developed calamus.

Octopus horridus, Orbigny.

One specimen (♀): no data.

A fairly typical specimen.

Octopus aegina, Gray

One specimen (♂) from Fish-market, Singapore: 14-8-29.

One specimen (♀) from Fish-market, Singapore: 14-8-29.

? One specimen (♀) from Sultan Shoal, Singapore: 27-11-30. (Young specimen).

The two adults correspond pretty closely with the original description and my redescription (1928^a, p. 641), and I do not hesitate to identify the forms. This makes it all the more remarkable that the peculiar form of the male organs described by me (1929, p. 114) is not found here. The male organs are evidently far more variable than I thought, (perhaps subject to seasonal or functional variation).

The identity of the young specimen is a little doubtful.

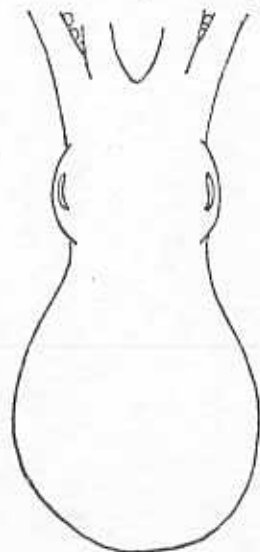


Fig. 1.—*Octopus smedleyi*
Outline of body and head. $\times 2$

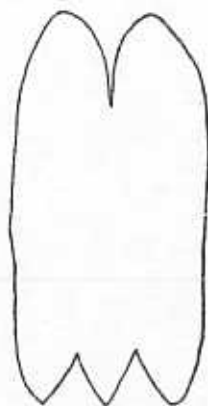


Fig. 2.—*Octopus smedleyi*
Funnel-organ. $\times 5$.

Octopus (Octopus) smedleyi, n. sp.

(Text figs. 1, 2)

Dimensions (in mm.).	Arms	L.		
		1		82
		2		69
		3		84
		4		87
	Web	A		11
		B		18
		C		23
		D		24
		E		22
	Mantle, length			30
				width
				22
	Head, width			12

This form has a saccular body, the width being 73% of the length. The maximum width lies above the middle of the body. The head is much narrower than the body and is rather elongated. The eyes are inconspicuous. The arms seem to be in the order 4, 3, 1, 2, (?) and to attain a maximum length of 74% of the total length. The web has the formula D=E. C. B. A. and is shallow (? 20% of the arms). A is under half of the depth of D. There is no trace of colour. The surface of the dorsum

is closely covered with small, usually round, simple warts. These tend to be more closely set on the mantle than on the web.

The mantle-aperture is distinctly narrow (B.). The funnel is very long and slender and is free for half its length. The lumen of the funnel is very narrow and the funnel organ is of very characteristic shape (fig. 2).

The ink-sac is present and is half buried in the liver.

The oviduct is slender with a very slight vaginal expansion. There is a small circular "oviducal gland". The proximal oviduct is much shorter than the distal.

Remarks.—This is a very characteristic form distinguished by its narrow mantle-aperture, long slender funnel, peculiar funnel-organ, the form of the web and the shape of body and head. These constitute a combination of characters which has not hitherto been described.

Octopus sp. (? near *gardineri*, Hoyle)

4 specimens (♀) "from cables either off Malacca or Timor Sea."

These four specimens range in mantle-length from 19-12mm. Some eggs (measuring c. 3mm.) were in the same tube and as one egg mass was entangled in the arms of one of the specimens I assume they are referable to this specimen. The latter would then be sexually mature.

The specimens are very difficult to determine, as they are in some respects very like *O. gardineri* but unlike it in others. Very fortunately there is a set of specimens (86.11.1-5), from Singapore in the British Museum undoubtedly referable to this form which enables us to give a pretty clear picture of it. These measure 23-11 mm. The smaller specimens tend to be squarish in body-shape. The largest and medium sized specimens have a bursiform, broadly ovoid body and eyes which vary from the moderately prominent to the very pronounced and are very like those in Hoyle's figure of *O. gardineri* (Hoyle 1905, f. 145). Three of the available medium sized specimens are very like the latter in general shape. As in that species the arms are moderately long (75%) and in the order 4, 3, 2, 1. The web again, as in *gardineri*, is sub-equal and about 22%. In the males the suckers increase rapidly from the mouth outwards but not nearly so abruptly as in *gardineri*.

The eyes are usually, but not always, surrounded by four low multifid cirri, of which the two upper ones are the larger. The body and web is covered with a coating of numerous small granules of various sizes. In addition there is a sparse number of irregular, sometimes roughly stellate cirri. The sculpture is thus more developed in these specimens, but in one or two the ocular cirri are absent, as in *gardineri*.

The hectocotylus is 3mm. long (or 5.1% of the arms) and thus is longer than that of *gardineri*. It is slender and compressed. In the largest specimen the ligula is well developed but the calamus is ill-defined.

Octopus ? macropus Risso, var.

Five specimens (♀) from Fishmarket, Singapore; 14-8-29.

Three specimens (2♀, 1♂) from Fishmarket, Singapore; 12-8-29.

These specimens have long arms (81-84%), usually in the order 1.2.4.3, and a shallow web (about 15%). The funnel organ is W-shaped. The web usually has the formula A.B.C.D. = E. The single male has a very small and undifferentiated hectocotylus. The mantle varies, as described by me (1929, p. 105), from a rather broadly oval shape to a very narrow and almost cylindrical one. The surface is smooth. I do not know if the hectocotylus is properly formed. If it is, it constitutes a marked difference from *macropus*. The surface is occasionally smooth in *macropus*; but I suspect this is usually an effect of bad preservation. Sasaki's *variabilis* (1929, p. 90) might be compared; but I am doubtful of the distinction between this species and *macropus*.

Octopus sp. (group of *O. australis*)

One specimen (♂): no data.

This specimen is in a very bad condition. The hectocotylus, however, is well preserved and in its size, short broad and thick shape, with heavily inrolled sides and long narrow calamus, is very like that of *O. australis* (Robson, l.c., fig. 51).

ORDER DECAPODA

Inioteuthis ? bursa Pfeffer, var.

One specimen (♀) from Fish-market, Singapore, 14-8-29.

Two specimens (♀) from Fish-market, Singapore, 12-8-29.

The species of *Inioteuthis* are by no means easy to identify owing to the lack of comparable data. This specimen seems referable to Pfeffer's rather scantily described species. It is certainly more nearly allied to it than to the other known forms. It differs in the following points.

(1) The arms are subequal or perhaps 2=3=4. 1 (the actual sizes are 25, 27, 20, 20mm.).

(2) The mantle is just a little longer than wide (24:21mm.) (Pfeffer, 33.5:26).

(3) The longest arms are longer than the mantle, the shortest about as long, the second being not quite so long as the longest (Pfeffer "Der 2 te gleich 5/4 der Mantellänge.")

(4) The dark reticulation is found practically over the mantle. Otherwise the three specimens conform to Pfeffer's description. The tentacle measures 78mm. and is therefore about thrice as long as the mantle. The arm-suckers seem to be smooth, but may have an obscure and irregular denticulation. The tentacular suckers are extraordinarily small, in fact the smallest in any adult Cephalopod known to me. Their diameter seems to be about 0.1 mm. The periphery does not seem to be "ohne Ringe" (Pfeffer). At least it is ornamented by at least 3 rows of pieces; but it is hard to say if these are chitinized.

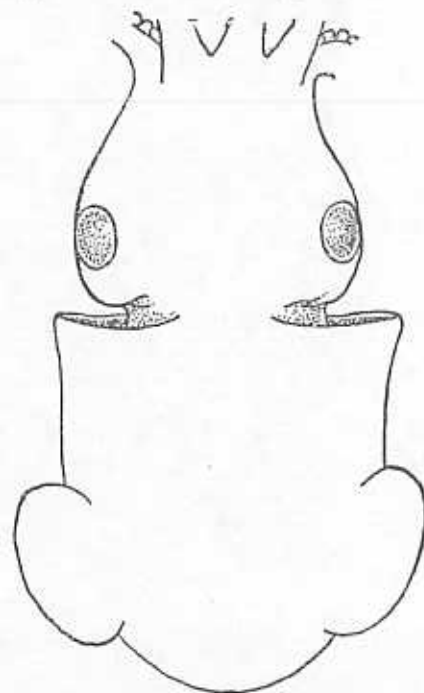


Fig. 3.—*Sepiadarium malayense*, type. $\times 3$.

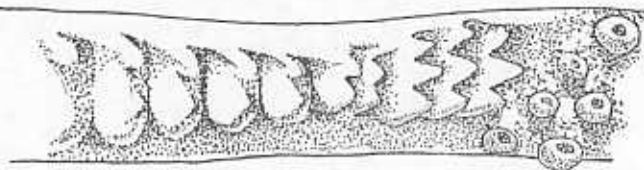


Fig. 4.—*Sepiadarium malayense*. Hectocotylus.

Sepiadarium malayense, n. sp.

(Figs. 3, 4)

One specimen (♂) from Fish-market, Singapore; 12-8-29.

Type.—in the Raffles Museum (Holotype).*Measurements* (mm.)

Dorsal Mantle-length: 17

Dorsal Mantle-width: 14.

Fins, length: 7

1st arms (± 1) 13

2nd „ 15

3rd „ 16

4th „ 16

Tentacles, length 27.

The body is longer than wide (width 82% of length). The fins are under half the mantle-length and narrow (the width being half the length). The arms are in the order 4=3.2.1. with very little difference between them. The tentacles are under twice the mantle-length and have a very narrow manus. The arm-suckers are in two rows, which, on most of the arms, become so diagonally disposed at the base of the arm as to appear quite uniserial. Distally they are in more numerous rows. The hectocotylus is very characteristic. It consists of 19-20 modified sucker rows which take the form of bilobed lappets of which the lobes on one side are larger than the others. The latter are united by a delicate lateral membrane, which is absent on the other side of the arm.

This species is clearly distinguished from the other species (see Berry 1921, p. 351) as follows:—

1. From *auritum* by its small fins,
2. From *kochii* by the form of the hectocotylus, arrangement of the suckers, form of manus and body,
3. From *austrinum* by the form of the fins, order of the arms, arrangement of the suckers and the form of the hectocotylus.

The form of the hectocotylus is very characteristic and is enough in itself to distinguish this form from the other three species. It is noteworthy that the form is quite distinct from the widely-distributed *S. kochii*.

Sepia singaporensis, Pfeffer

Five specimens (♀) from the Fish-market, Singapore, 14-8-29.

One specimen (♀) from the Fish-market, Singapore, 12-8-29.

These specimens agree fairly closely with the original description in sucker-dentition, shape, arm-length, shell and the form of the manus. They differ (a) in the narrowness of the fins and (b) in the fact that the outermost row of suckers on that side of the manus which bears three rows is not exceptionally small, as Pfeffer states. I do not think that there is much doubt as to the specific identity of these specimens.

Sepia sp.

Four specimens (♀) from the same locality as the above; same date.

These forms have the same broadly ovate form as *S. torosa* Ortmann and *hoylei* Ortmann; but they differ in the shell, which has a very extensive striated area (nearly 5/6 of the total length and thus like Rochebrune's *verreauxii*) and exceedingly wide chitinous border in the neighbourhood of the inner cone. The manus is longer than in either of Ortmann's species. The specimens are undoubtedly young and I am unwilling to dogmatize as to their specific identity.

Sepia sp. ? *esculenta*, Hoyle, var.)

One specimen (♀) from the Fish-market, Singapore, 14-8-29.

Measurements (mm.).

Length of mantle, dorsal	..	..	116	
Length of mantle, ventral	..	..	98	
Maximum width of mantle	..	..	48	
Maximum width of fins	..	..	12	(±1)
Length of arms 1st R.	..	..	48	50
" " 2nd R.	..	..	51	52
" " 3rd R.	..	..	52	52
" " 4th R.	..	..	62	62
" " tentacles	..	..	128	(±)
" " manus	..	..	30	

The body is elongate-conical and is rather narrower than the figured (♀) specimen; actually it fairly closely resembles the male "Challenger" specimen in general shape and in the form of

* Unfortunately nothing is known about the tentacles of the "Challenger" specimens.

the dorsal edge of the mantle and anterior ends of the fins. The fins are slightly narrower (Hoyle's figures). The fourth arms as in *esculenta* are the longest, the first, second and third being subequal. The tentacular manus is from one-quarter to one-fifth of the tentacle in length, (a good deal longer than in Sasaki's description, but only a little longer than that indicated in Appelhof's (1886, p. 28). The club is simple, narrow and covered with very numerous subequal suckers. The basal arm suckers are smooth. Those succeeding them have a number of low and irregular denticles sometimes aggregated into sets on the distal edge; in the median teeth these are longer, narrower and distally they become obscure and even absent. The type-description of the arm-suckers ("smooth") is wrong.

They are certainly smooth at the base, but in the middle of the arm I find them obscurely denticulate and not unlike those described above. In Appelhof's figures of the suckers the denticulation seems to be more regular and in his figure of the basal suckers the teeth are shown as broad and chisel-like. This may, however, indicate the fused-up condition I have found. Sasaki (l.c. p. 175) notes the tendency of the teeth on the proximal suckers to fuse up, but he says the whole edge of these suckers are thus toothed. On the whole I do not think there is any marked difference between their accounts and mine.

The suckers of the tentacles have a complete circlet of small, separate and sharp teeth; but those on the proximal periphery are extremely short and indistinct. Those on the distal half are longer and more triangular. This agrees with the condition figured by Appelhof, though he shows the teeth as larger. It does not quite agree with Sasaki's reference to "blunt" teeth.

The colour (in spirit) is a greyish purple dorsally. The ventral surface is ochreous with a close powdering of fine chromatophores. Dorsally the colour is variegated by a series of wavy, anastomosing, transverse lines, on some of which are developed large sub-circular spots. These are paler than the purple ground colour. This pattern of wavy transverse lines is seen in *subaculeata*, but there are no spots. Hoyle's figure shows a series of peripheral spots not seen in this specimen nor indeed in either of the original specimens. The colour in the latter is very badly preserved, but in one it is possible to see lines and spots very like those of the Singapore specimen.

The shell measures 113×36 mm. (index 31). It is more slender than those of the previously described specimens of *esculenta*. However, the narrower of the type-specimens measures 158×52mm. (index 32). The striated area is very long and occupies nearly 5/6 of the total shell. The inner cone is very well developed and remarkably deeply hollowed out. Its

limbs are short and fairly narrow. The spine is prominent and well-developed. The shell differs from the two types of *esculenta* in three respects. (1) The striated area is somewhat less in size and is more pointed. (2) There is a median groove in the types. (3) The inner cone is much less prominent and arched in the types. The shape of the inner cone figured by Appelhof (l.c. pl. III, fig. 1) is quite like that of this specimen; that shown by Sasaki (pl. xvi) is more like that of the type. Our specimen very closely resembles *aculeata* (Sasaki l.c. fig. 12a.) in this respect.

Remarks.—On the whole this specimen agrees with the types of *esculenta*, the most marked divergence being in the shell and possibly in the colour-pattern. If Sasaki's and Appelhof's specimens are really referable to Hoyle's species then on the whole our specimen comes nearer the latter. *S. aculeata*, d'Orb., and *subaculeata*, Sasaki come very close to our specimen and I am not sure yet as to the degree of distinctness of *esculeata* from *aculeata*. The three forms in question, however, do show distinct differences and they may form part of a "Rassenkreis".

Sepia latimanus, Quoy and Gaimard

One example (♀) from off E. Coast of the Malay Peninsula 8-7-24.

On the whole this agrees with the form originally figured as *raiana* by Férussac (MS) and described by Quoy and Gaimard as *latimanus*. Unfortunately the shell has been removed which makes identification difficult. The species was originally described as having "petits transversaux sur les nageoires". Small pinkish gold transverse stripes are plentifully found in our specimen on the fins and sides and, more regularly shaped, on the arms as well. Irregular spots occur on the dorsum. This colour pattern is well seen in Sasaki's Japanese specimens described as *S. hercules*, Pilsbry. Sasaki suspected and I concur with him that *hercules* is synonymous with *latimanus*.

Loligo

The majority of the specimens of *Loligo* obtained were in very poor condition, the fins and arms being very badly damaged and the bodies flattened out of shape. Examination of the sucker-rings shows very clearly that there are four species represented. One of these has 8-11 low, wide teeth on the distal rim of the arms and about 17-20 well-spaced pointed teeth on the tentacular suckers. Another has 10-11 longish pointed teeth on the distal periphery of the sessile arm and some 13-14 widely spaced large teeth with a single (or rarely two) smaller tooth intercalated between them. From such measurements of the fins and bodies as I have been able to make satisfactorily the former species

seems very like *L. duvauceli* Orb. which has a wide occurrence in Oriental waters. It is represented by 18 specimens all taken in the fishmarket. The identity of the other, of which 3 specimens came from the same source, cannot be satisfactorily assessed. In addition there is a long slender form from unknown locality (1896). The suckers of the sessile arms have about 8 strong pointed teeth on the periphery of the ring. The tentacular suckers have about 13 large pointed suckers with 1-3 small denticles interpolated between them. Finally there are 3 small specimens from unknown locality which have 8 broad, squarish teeth on the rim of the suckers of the sessile arms and about 22 low pointed teeth openly spaced on the tentacle-suckers.

These forms are being made the subject of a separate study. I am not at all certain concerning the identity of certain species of Oriental *Loligo* and am undertaking a revision of the family.

Septoteuthis indica, Goodrich

One specimen (♀) from fish-market, Singapore, 14-8-29.

This specimen resembles Goodrich's type-specimen fairly closely though there is some departure in detail. I give the main characters using Wülker's indices (1913; p. 463) compared with those of Goodrich.

Measurements (mm.)	This specimen		Goodrich
	♀	♂	♀
Mantle, width-index ..	32	34	(from figure)
Fins, width-index ..	23	20	
Fins,—width mantle-width ..	62	59	
Longest arm % mantle-length	68	45	44 (calc.)
Tentacles % of total length	62	56	57 (")
Tentacles % of length of club	31	38	45
Teeth on suckers of sessile arms	28-30	20-28	
Teeth on suckers of tentacles	c.16	16-18	

The general shape is very similar. The spacing and shape of the teeth of the tentacular suckers is quite like that figured by Goodrich, albeit they are a bit more widely spaced. The teeth of the arm-suckers are not so blunt as those shown in Goodrich's figure, but the latter shows some teeth which are like those of the Singapore specimen. The peculiar feature noted by Goodrich at the end of the manus could not be made out in the (very much distorted) tentacles of our specimen. Each circumoral lappet bears 6-7 suckers.

One specimen (♂) from fish-market, Singapore; 14-8-29.

This is much larger than Goodrich's specimens and measures 226 mm. in dorsal mantle-length. It is in general agreement but whereas Goodrich says the buccal suckers are edentulous, on the proximal periphery they are clearly toothed in this specimen, though the teeth are very small and irregular.

One specimen (♂) from fish-market, Singapore; 1896. This is much larger than either of the preceding measuring 280 mm. in dorsal mantle-length. It is rather narrower (width index 29), and the widest part of the fins is rather more apical than usual. The oral suckers are rather different, as the teeth are more widely spaced and smaller, though they agree in number with those in Goodrich's figure. The apical modification of the manus is very clearly seen and involves the same number of suckers as is shewn by Goodrich.

I believe that these and other differences observed are simply due to age.

Four specimens (♀) from fish-market (12-8-29 and 14-8-29).

BIBLIOGRAPHY

1. Appellof, A. 1886. K. Svensk. Vet. AK. Handl., Bd., 21, No. 13.
2. Berry, S. S. 1921. Rec. S. Austr. Mus. I, No. 4, p. 347.
3. Bristowe, W. S. 1931. Ann. Mag. N. Hist. (10) viii, p. 461.
4. Hoyle, W. E. 1905. Fauna and Geography of the Maldives and Laccadive Archipelago: Vol. II, p. 975.
5. Hoyle, W. E. 1904. Report on the Pearl Fisheries of the Gulf of Manaar, pt. II, Suppl. Report XIV, p. 185.
6. Robson, G. C. 1928. Céphalopodes des Mers d'Indochine. Serv. Océanogr. Pêches de l'Indochine. 10^e Note.
7. Robson, G. C. 1928. Ann. Mag. Nat. Hist. (10) i, p. 641.
8. Robson, G. C. 1929. A Monograph of the Recent Cephalopoda, London. (British Museum). Vol. I.
9. Robson, G. C. 1932. in Festschrift für L. Plate. Jena. (in the Press), p. 14.
10. Sasaki, M. 1929. J. Coll. Agric. Tokyo, XX: Suppl. No.
11. Wülker, G. 1913. Abht. Senckenb. naturf. Ges. xxxiv, p. 451.